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EXAMINER
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LEUNG, JENNIFER A

ART UNIT	PAPER NUMBER
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1764

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DATE MAILED: 01/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/661,516

Applicant(s)

JAMES ET AL.

Examiner

Jennifer A. Leung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 15-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-18 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 September 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_ 6) ☐ Other: \_\_\_\_

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-14, drawn to a plate frame heat exchange reactor assembly, classified in class 422, subclass 198.
  - II. Claims 15-18, drawn to a method for optimizing heat transfer, mass transfer and pressure drop in a plate-frame heat exchange reactor, classified in class 165, subclass ---.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the process as claimed can be practiced by another materially different apparatus or by hand. The method of optimizing heat transfer, mass transfer and pressure drop in a plate-frame heat exchange reactor may be accomplished in a plate-frame heat exchanger comprising corrugated plates and a packing of inert heat transfer material, such as sand or alumina spheres.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification and the search required for Group I not required for Group II, restriction for examination purposes as indicated is proper.

2. During a telephone conversation with Mr. Damien Pocari on January 7, 2003, a provisional election was made with traverse to prosecute the invention of Group I, claims 1-14.

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Affirmation of this election must be made by applicant in replying to this Office action. Claims 15-18 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

3. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Drawings***

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because the following reference characters have been used to designate different, plural elements:

**311** has been used to designate both a “next adjacent header sheet” (page 16, line 21+) and what appears to be a “burner outlet” in FIG. 5.

**301** has been used to designate both a “serial flow reformer” (page 16, line 6+) and what appears to be an “inlet port for feed” in FIG. 5.

**302** has been used to designate both a “parallel flow reformer (page 16, line 7+) and what appears to be a “header sheet” in FIG. 5.

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference signs mentioned in the description:

**205b** feed gas outlet port (page 13, line 31+)

**311a** first header sheet (page 16, line 15+)

**313a** interleaved sheet (page 16, line 18+)

**313** next adjacent interleaved sheet (page 16, line 24)

6. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference signs not mentioned in the description:

**317, 302a, 303a, 320, 305, and 305a**

7. The drawings have not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference signs in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Specification***

8. The disclosure is objected to because of the following informalities:

- On page 7, line 5, “louvres **121**” should be changed to -- louvres **111** --, for consistency with FIG. 2A.
- On page 12, line 2, “outlet ports **190**” should be changed to -- burner inlet ports **190** --, as set forth on page 11, line 25.

9. The specification not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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10. Claims 1-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, “said feed gas inlet manifold” (line 24), “said adjacent reformer channel” (line 30), “said adjacent burner channel” (line 39-40), “said exhaust burner gas flow” (line 49-50), and “said exhaust gas flow” (line 52-53) lack proper positive antecedent basis.

Regarding claim 8, “said coupled burner” (line 24-25), “said exhaust burner gas flow” (line 53), “said burner gas flow” (line 61, 62) and “said exhaust gas flow” (line 65-66) lack proper positive antecedent basis.

Regarding claim 12, it is unclear as to the structural limitation applicants are attempting to recite by, “a dispersed catalytic metal adhered to a stainless steel structure adhered to a super alloy,” and where it is disclosed in the specification and/or drawings.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 1-3 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Furuya et al. (JP 06-111838).

Regarding claims 1 and 3, Furuya et al. (Abstract; Machine Translation; Figures) disclose a plate frame heat exchange reactor assembly comprising:  
a plurality of header sheets (i.e., plates 2; FIG. 1, 2), each having a plurality of manifold ports

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(i.e., shown as holes **25**, **28**, etc. of combustion plate **20** in FIG. 7; section [0034]-[0035])

and a heat transfer surface contained within a central region of each header sheet;

a plurality of interleaved sheets (i.e., plates **1**; FIG. 1, 2), one interleaved sheet **1** being located between each adjacent pair of header sheets **2**, wherein each of said plurality of interleaved sheets **1** comprises a plurality of interleaved manifold ports (i.e., shown as holes **26**, **27**, etc. of reforming plate **22** in FIG. 7; section [0034]-[0035]);

one of said plurality of interleaved sheets **1** and an adjacent one of said plurality of header sheets **2** defines a cell (i.e., fluid passages **3**, **4** in FIG. 1, 2; or passages **21**, **23** in FIG. 7);

a feed gas inlet manifold port (i.e., as shown in FIG. 7, port **27** functions as the feed gas inlet to reforming plate **22**; section [0034]-[0035]);

a burner feed inlet manifold port (i.e., as shown in FIG. 7, a port -- not illustrated -- located upstream of channels **21** functions as the burner feed inlet to combustion plate **20**; section [0034]-[0035]);

a reformer section (i.e., within a first reforming machine **42**; FIG. 8; section [0040]-[0043])

having a plurality of reformer channels (i.e., passages **3** comprise a thin layer of reforming catalyst **6**, FIG. 1, 2; shown as passages **23** in FIG. 7) being coupled to the feed gas inlet manifold port **27**, each channel being formed between every other cell, wherein each reformer channel **3** is coupled to an adjacent reformer channel **3** through at least one of said plurality of manifold ports and interleaved manifold ports (i.e., as shown in FIG. 7, reformer channels **23** of plate **22** coupled to adjacent reformer channels of plate **22a**, **22b**, etc. via manifold ports **27**; section [0034]);

a burner gas section (i.e., within the first reforming machine **42**; FIG. 8; section [0040]-[0043])

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having a plurality of burner channels (i.e., passages **4** comprising a thin layer of combustion catalyst **5**, FIG. 1, 2; shown as passages **21** in FIG. 7) being coupled to the burner feed inlet manifold port (i.e., the port -- not illustrated -- upstream of channels **21**; FIG. 7), each burner channel **4** being formed between the other of every other cell, wherein each burner channel **4** is coupled to an adjacent burner channel **4** through one of said plurality of interleaved manifold ports and one of said plurality of manifold ports (i.e., as shown in FIG. 7, burner channels **21** of plate **20** coupled to adjacent burner channels of plate **20a**, **20b**, etc. via manifold ports **25**; section [0034]);

an outlet manifold port coupled to said reformer section (i.e., as shown in FIG. 7, a port -- not illustrated -- located upstream of channels **23** functions as the outlet manifold for reformed gas produced in reforming plate **22**; section [0034]-[0035]); and

a burner outlet manifold port coupled to said burner section (i.e., as shown in FIG. 7, port **25** functions as the burner gas outlet from burner plate **20**; section [0034]-[0035]);

wherein the assembly may be configured for cross-flow with respect to the flow of feed gas and exhaust gas in the reformer and burner sections, or between a pair of adjacent cells (i.e., as shown in FIG. 12, reformer sections **56** having a substantially perpendicular flow to burner sections **56**, **58**; section [0065]).

Regarding claim 2, Furuya et al. further disclose a second inlet manifold port coupled to one of said reformer channels between one of said plurality of header sheets and one of said plurality of interleaved sheets (i.e., as shown in FIG. 7, a second inlet manifold port **27** inherently located in subsequent reforming plates **22a**, **22b**, etc., which feeds reformer channels **23**; section [0034]-[0035])



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Regarding claim 7, Furuya et al. (FIG. 8, section [0040]-[0043]) further disclose a parallel zone interspersed within the assembly, the zone comprising: at least one second reformer section coupled to a third inlet manifold port (i.e., a second reforming machine **42**), the second reforming section having reforming channels and a feed gas inlet manifold structured similarly to the first reforming section discussed above (see comments made in claim 1); at least one second burner gas section (i.e., within the second reforming machine **42**), the second burner gas section having burner channels and a burner feed inlet manifold structured similarly to the first burner section discussed above (see comments made in claim 1); wherein the flow of the third stream of feed gas and the flow of the second stream of burner feed gas through the zone are substantially parallel, comprising either a co-flow or counterflow configuration with respect to one another (i.e., co-flow in FIG. 4, section [0029]; counterflow in FIG. 7, section [0034]-[0035]).

Instant claims 1-3 and 7 structurally read on the apparatus of Furuya et al.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 6, 8-10, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya et al. (JP 06-111838).

Regarding claim 6, Furuya et al. disclose the plurality of plates for each of the header and interleaved sheets may comprise a material with a high thermal conductivity (such as metal), the plates each being “laminated” one on top of another (section [0016]-[0017]). Although Furuya et al. is silent as to the lamination being conducted by “brazing” metal plates together, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate lamination means, such as brazing, for plurality of plates in the apparatus for Furuya et al., since such lamination means is well known in the art.

Regarding claims 8-10, the same comments with respect to Furuya et al. apply (see comments in claims 1-3 above; see also FIG. 16, 18 and sections [0085]-[0086]). Furuya et al. further disclose the assembly may exhibit a flow configuration wherein, the feed gas flow in the coupled reformer channel and the burner gas flow in the next adjacent coupled burner channel are substantially perpendicular with respect to one another (i.e., feed gas flowing from inlet **d** to outlet **h** in reformer plate **122** flows perpendicular to the burner gas flowing from inlet **e/f** to outlet **a** of burner plate **121**;

the feed gas flow in the coupled reformer channel and the feed gas flow in a next adjacent coupled reformer channel flows in opposite directions with respect to one another (i.e., the feed gas flows from inlet **d** to outlet **h** via the channels of reformer plate **122**, and the feed gas flows from inlet **h** to outlet **c** via the channels of reformer plate **120**; and the feed gas flow and the exhaust gas flow are substantially cross-flow with respect to one

another in the reformer and burner sections (see FIG. 16, 18).

Furuya et al. are silent as to whether the burner gas flow in the coupled burner channel and a next adjacent of coupled burner channel may flow in opposite directions with respect to one another (i.e., instead, Furuya et al. discloses the gas flow in the channels of burner plates **121** being co-flow; FIG. 18). In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate flow direction in the respective burner channels in the apparatus of Furuya et al., on the basis of suitability for the intended use, because the rearrangement of inlets and outlets to achieve a desired flow configuration and/or temperature profile is conventional knowledge in the art of heat exchange, as evidenced by Furuya et al. (i.e., sections [0037]-[0038] teach the reconfiguration of holes **25**, **26**, **27** and **28** to achieve temperature equalization). Additionally, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller*, 105 USPQ 233.

Regarding claims 13 and 14, the same comments with respect to Furuya et al. apply (see comments in claims 6 and 7 above, respectively).

13. Claims 4, 5, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuya et al. (JP 06-111838) in view of Cornelison et al. (US 4,829,655).

Furuya et al. disclose the reforming **6** and combustion **5** catalysts (FIG. 1, 2) each comprise a dispersed catalytic metal (i.e., see sections [0019]-[0020]) on a layer of alumina (i.e., the use of  $\gamma$ -alumina being well known in the art of catalysis; see also sections [0022]-[0023]), the layer of alumina being adhered to a suitable structure, such as a plate with high thermal conductivity (i.e., a metal plate; section [0017]). Although Furuya et al. is silent as to the

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
structure comprising a superalloy and/or stainless steel, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate thermally conductive material (i.e., such as the instantly claimed materials) for the structure in the apparatus of Furuya et al., since the use of such materials for catalytic supports is well known in the art of catalysis, as evidenced by Cornelison (see column 2, lines 32-46). Additionally, the substitution of known equivalent structures involves only ordinary skill in the art. *In re Fout* 213 USPQ 532 (CCPA 1982); *In re Susi* 169 USPQ 423 (CCPA 1971); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *In re Ruff* 118 USPQ 343 (CCPA 1958).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Jennifer A. Leung  
January 12, 2004 

  
**HIEN TRAN  
PRIMARY EXAMINER**